



Mortality related to temperature and persistent extreme temperatures: A study of cause-specific and age-stratified mortality

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Abstract:

OBJECTIVES: High and low ambient temperatures are associated with large numbers of deaths annually. Many studies show higher mortalities during heatwaves. However, such effects are rarely explicitly incorporated in models of temperature and mortality, although dehydration followed by cardiovascular stress is more likely to occur. The authors aim to establish time-series models in which the effects of persistent extreme temperature and temperature in general can be disentangled. **METHODS:** The authors established time-series Poisson regression models based on cause-specific mortality and age-stratified mortality in Stockholm County (Sweden), 1990-2002, adjusting for time trends and potential confounders, and studied the effects of temperature and persistence of extreme temperature. **RESULTS:** Persistent extremely high temperature was associated with additional deaths, and the risk of death increased significantly per day of extended heat exposure. Extreme exposure to heat was associated with higher death rates in adults and for cardiovascular causes of death, compared with a rise in temperature. Warmer temperatures increase daily mortality from natural causes, while decreasing colder temperatures increase the risk of cardiovascular deaths. Furthermore, the impact of warm and cold temperatures decreases within the season, while the impact of persistent extremely high temperatures remains similar throughout the summer. **CONCLUSIONS:** The authors found the mortality impact of persistence of extreme high temperatures to increase proportionally to the length of the heat episode in addition to the effects of temperature based on the temperature-mortality relationship. Thus, the additional effect of persistent extreme heat was found to be important to incorporate for models of mortality related to ambient temperatures to avoid negatively biased attributed risks, especially for cardiovascular mortality. Moreover, the effects associated with non-extreme temperatures may decline as the pool of fragile individuals shrink as well as due to acclimatisation/adaptation. However, a similar decline was not observed for the effects associated with extreme heat episodes.

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Resource Description

Exposure : ☐

weather or climate related pathway by which climate change affects health

Air Pollution, Temperature

Air Pollution: Ozone, Other Air Pollution

Air Pollution (other): NOx

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Temperature: Extreme Heat

Geographic Feature: ☒

resource focuses on specific type of geography

None or Unspecified

Geographic Location: ☒

resource focuses on specific location

Non-United States

Non-United States: Europe

European Region/Country: European Country

Other European Country : Sweden

Health Co-Benefit/Co-Harm (Adaption/Mitigation): ☒

specification of beneficial or harmful impacts to health resulting from efforts to reduce or cope with greenhouse gases

A focus of content

Health Impact: ☒

specification of health effect or disease related to climate change exposure

Cardiovascular Effect, Injury, Respiratory Effect

Mitigation/Adaptation: ☒

mitigation or adaptation strategy is a focus of resource

Adaptation

Population of Concern: A focus of content

Population of Concern: ☒

populations at particular risk or vulnerability to climate change impacts

Elderly

Resource Type: ☒

format or standard characteristic of resource

Research Article

Timescale: ☒

time period studied

Time Scale Unspecified

Vulnerability/Impact Assessment: ☒

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resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content